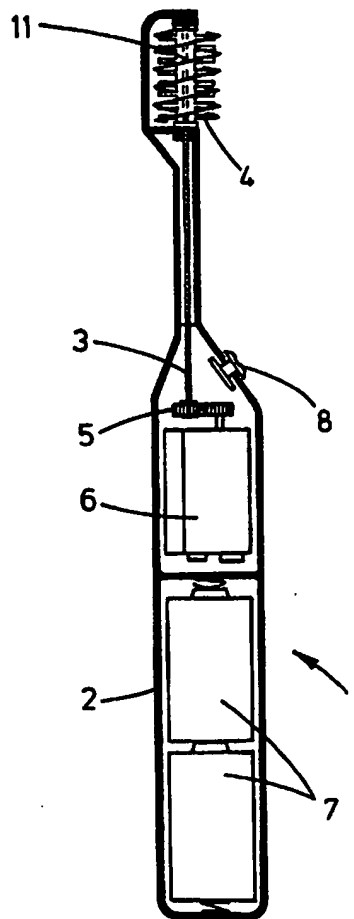


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>A61C 17/26</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 97/04719</b> <b>(43) International Publication Date:</b> 13 February 1997 (13.02.97)
<b>(21) International Application Number:</b> PCT/GB96/01804 <b>(22) International Filing Date:</b> 26 July 1996 (26.07.96) <b>(30) Priority Data:</b> 9515629.5      29 July 1995 (29.07.95)      GB <b>(71)(72) Applicant and Inventor:</b> STEWART, Timothy, Nathaniel [GB/GB]; 19 Mayfield Road, Handsworth, Birmingham B19 1RL (GB). <b>(74) Agents:</b> HOUGHTON, David et al.; Hulse & Co., Eagle Star House, Carver Street, Sheffield S1 4FP (GB).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.          Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

**(54) Title:** TOOTHBRUSH**(57) Abstract**

The invention relates to toothbrushes and is particularly concerned with powered toothbrushes. The objective of the invention is to provide a toothbrush that seeks to minimise the manual movement of the brush during use, which objective is met by a construction comprising a carrier (2), a support arm (3) rotatively secured to the carrier, a cleaning head (4) at the outer, free end of the support arm, and a drive means (6) associated with the carrier to cause the rotation of the arm. Most desirably the support arm can be selectively rotated in opposite directions.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

## TOOTHBRUSH

This invention relates to toothbrushes.

Predominantly, toothbrushes are manually operated, and effective cleaning of the teeth is reliant on the dexterity of the hands of the user. For those with disabilities affecting the hands and arms, the infirm, and those weakened by illness, manual cleaning of the teeth can be a difficult task that cannot be performed effectively. Even with the able bodied, manual cleaning of the teeth can be improved upon.

To assist in the cleaning of teeth a variety of powered toothbrushes are available. Ordinarily it has been the case of applying an oscillatory movement to an arm carrying the bristle head from a small mains or battery operated electric motor located in the toothbrush handle or body from which the arm extends.

The result is a short arcuate movement of the bristle head, not of itself ideal in removing debris from the vertical junction between adjacent teeth, and therefore still requiring an appreciable degree of manual movement to supplement the oscillatory movement of the bristle head to bring about effective cleaning of the teeth.

The object of the invention is to provide a powered toothbrush capable of minimising the requirement to move the toothbrush manually.

According to the present invention, a toothbrush comprises a carrier, a support arm rotatively secured to the carrier, a cleaning head at the outer, free end of the

support arm, and a drive means associated with the carrier to cause the rotation of the arm. Most desirably, the support arm may be selectively rotatable in opposite directions for more effective cleaning of the fronts and backs of the upper  
5 and lower sets of teeth. In addition to lending considerable assistance in correct cleaning, the selection of rotation is to cause a rotation of the cleaning head that is in the direction from the gum to the outer extremity of the teeth, to avoid the possibility of damage being caused to the gums.

10 Further desirably, and in addition to the selective rotation of the cleaning head, the cleaning head may be caused to reciprocate in an axial direction, whereby to provide a compound movement of the cleaning head that adds significantly to the cleaning action on the teeth.

15 The carrier may be a housing to serve as the handle of the toothbrush, and a small mains or battery operated electric motor may be located in the housing to apply a rotary drive to the support arm. Equally, the carrier may be attached such as by a flexible drive to a remote motor, with  
20 a connection through the carrier to the support arm.

The support arm may be detachably secured to the carrier, or the cleaning head may be detachably mounted on the end of the support arm. Thus, one carrier unit can serve a number of users, each of whom would have their own support  
25 arm/brush head for attachment to the carrier as and when cleaning of their teeth is required.

The cleaning head may be of bristle construction and the bristles of the bristle head may be of uniform length to

provide a bristle head of generally cylindrical character. Preferably, however, the bristle head is shaped to provide a tooth-like profile at the periphery of the bristle head, and further preferably, the crests of the tooth-like profile have  
5 a helical configuration along the length of the bristle head.

Equally, the cleaning head can be formed as a generally cylindrical member of a relatively soft or resilient material, such as for example foam rubber, to suit users with a medical condition making it essential that the  
10 gums are not damaged and caused to bleed, or those with gum disorders of a painful nature.

To protect such as the inner faces of the lips and the cheeks of the user when cleaning the outer faces of the teeth, and the tongue of the user when cleaning the inner  
15 surfaces of the teeth, it is preferred to provide a guard to overlie the rotary cleaning head to one side.

The toothbrush of the invention can be further enhanced by providing a fluid supply to the cleaning head such as down a bore formed in the support arms and associated  
20 apertures through the wall of the support arm and communicating with the cleaning head. The toothbrush of the invention can be still further enhanced by providing for the vacuum extraction of fluid from the mouth of the user, either through the bore previously used to supply fluid, or through  
25 a separate channel formed in or associated with the support arm to allow the continuous supply and removal of fluid during use. Preferably, a bleed hole to atmosphere is associated with the vacuum extraction means and to avoid an

excessive build-up of vacuum in the mouth of the user should the mouth inadvertently close on to the cleaning head.

In its basic form of construction, the cleaning head can simply be placed by the user at the junction of the teeth and the gums and the drive activated, and with the cleaning head rotating, the toothbrush moved gently over the length of the teeth. The rotation of the brush generates a vertical scrubbing action against the teeth, ideally suited to cleaning not only the face of the teeth but also the junction between adjacent teeth. By providing for the selective opposite rotation of the cleaning head, the direction of rotation can be selected such that when cleaning the front or the back of the upper or the lower set of teeth, the direction of rotation can be selected to drive debris towards and clear of the outer edge of the teeth. By being able to select the direction of drive, the toothbrush of the invention enables both left hand and right hand usage. When provided, the additional reciprocatory motion applied to the cleaning head adds noticeably to the cleaning action on the face of the teeth without affecting the ability of the toothbrush to avoid damage to the gums and lips of the user.

Several embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a front elevation of one embodiment of toothbrush in accordance with the invention;

Figure 2 is an end view of the toothbrush of Figure 1;

Figure 3 is a schematic cross-sectional view of the toothbrush of Figure 1;

Figure 4 corresponds to Figure 3 but shows a second embodiment of toothbrush in accordance with the invention;

5 and

Figure 5 is a perspective view of a third embodiment of toothbrush in accordance with the invention.

In the drawings, a toothbrush 1 is formed by a carrier or handle portion 2, and a support arm 3 on which is  
10 positioned a cleaning head 4. At the opposite (innermost) end of the support arm, reduction gearing 5 is provided to connect the support arm 3 to a motor 6 located in the carrier, the motor 6 being driven by batteries 7 also located within the carrier. On the carrier switch means 8 are  
15 provided whereby the direction of drive of the motor can be selectively reversed, and whereby to cause a rotation of the support arm and hence the cleaning head in a required direction. The arrangement may be such that in addition to a battery drive, mains drive can be employed. Thus, as is  
20 shown particularly by Figure 2, a connection 9 to mains may be provided, which connection to mains may also be employed to recharge the batteries 7, when rechargeable batteries are employed.

At the outer end of the carrier and where the  
25 cleaning head is positioned, the carrier is so-formed as to provide a guard 10 to overlay a part of the cleaning head to protect the lips, cheeks, and tongue of the user.

The cleaning head 4 is preferably of bristle

construction, the bristles 11 of which are of uniform length to form a generally cylindrical structure. Desirably, however, the bristles are shaped to provide a tooth-like profile at the periphery, and the crests of the tooth-like  
5 profile having a helical configuration along the length of the cleaning head.

Thus, in its basic form of construction the cleaning head 4 can simply be placed by the user at the junction of the teeth and gums, and the switch 8 activated to cause the  
10 cleaning head 4 to be rotated. When it is the front of the teeth that are being cleaned, the direction of drive is selected to provide a downward motion of the bristles 11 from the gum to the edge of the teeth, and when it is the back of the teeth that are being cleaned, an opposite direction of  
15 drive is selected again to result in a bristle movement direction from the gum to the teeth edge.

In addition to the selective rotary motion imparted to the cleaning head, it can, with advantage, be so arranged that during rotation in either direction an axial oscillatory  
20 motion can be imposed. Thus, as is shown schematically in Figure 4, the support arm 3 may be formed from a tough plastics material, and at a point along the length of the support arm, where it is positioned within the carrier 2, a sector or a sleeve 12 of ferro-magnetic material may be  
25 provided, surrounded by a small solenoid 13 connected to the batteries 7 via the switch 8, with an interposed make-and-break contact 14. To the opposite side of the reduction gears to the support arm, a return spring 15 is provided.



The reduction gearing 5 may have one of its gear wheels of an enlarged length to permit a sliding motion as between the two gears without the disconnection of the one from the other. Thus, and in this form of construction, when the toothbrush is switched on, and to rotate the cleaning 4 in either direction, there is a rapid activation and de-activation of the solenoid 13 to cause the ferro-magnetic sector 12 on the support arm to be drawn into the solenoid (when switched on) and ejected from the solenoid (when switched off) under the action of the spring 15.

To enhance the effectiveness of the toothbrush of the invention still further, it may be adapted to serve as the toothbrush of the equipment described and claimed in European Patent Application 91919704.6, a construction where water is provided to the cleaning head and extracted from the mouth of the user by vacuum, thereby allowing the toothbrush to be used most effectively, and without any discomfort to, such as, patients who must be left in a prone position. Thus as is shown in Figures 2 and 5, a water inlet 16 and a water outlet 17 may be provided on the carrier, for connection to a water feed tube 18, and a vacuum extraction tube 19 leading to transportable equipment 20 on which is provided vacuum pump means and water supply means. Within the carrier, inlet and outlet water passageways are provided from the inlet 16 and outlet 17 leading to the cleaning head 4.

## CLAIMS

1. A toothbrush characterised by a carrier 2, a support arm 3, rotatably secured to the carrier, a cleaning 4 at the outer free end of the support arm 3, and a drive means 6 associated with the carrier to cause the rotation of the arm 3.

2. A toothbrush as in Claim 1, characterised in that the support arm 3 is selectively rotatable in opposite directions whereby to allow for more effective cleaning of the fronts and backs of the upper and lower sets of teeth.

3. A toothbrush as in Claim 1 or Claim 2, characterised in that the carrier 2 is a housing to serve as the handle of the toothbrush and a mains or battery operated electric motor 6 is located in the housing to apply a rotary drive to the support arm 3 in accordance with the setting of an ON/OFF/DIRECTION switch 8.

4. A toothbrush as in any of Claims 1 to 3, characterised in that the support arm 3 constitutes a flexible drive from the motor to the cleaning head.

5. A toothbrush as in any of Claims 1 to 3, characterised in that the cleaning head 4 is detachably mounted on the end of the support arm 3.

6. A toothbrush as in any of Claims 1 to 5, characterised in that the cleaning head 4 is of bristle construction and the bristles 11 of the bristle head are of uniform length to provide a bristle head of a cylindrical character.

7. A toothbrush as in Claim 6, characterised in that

the periphery of the bristles 11 are formed to a tooth-like profile, with the crests of the tooth-like profile having a helical configuration along the length of the bristle head.

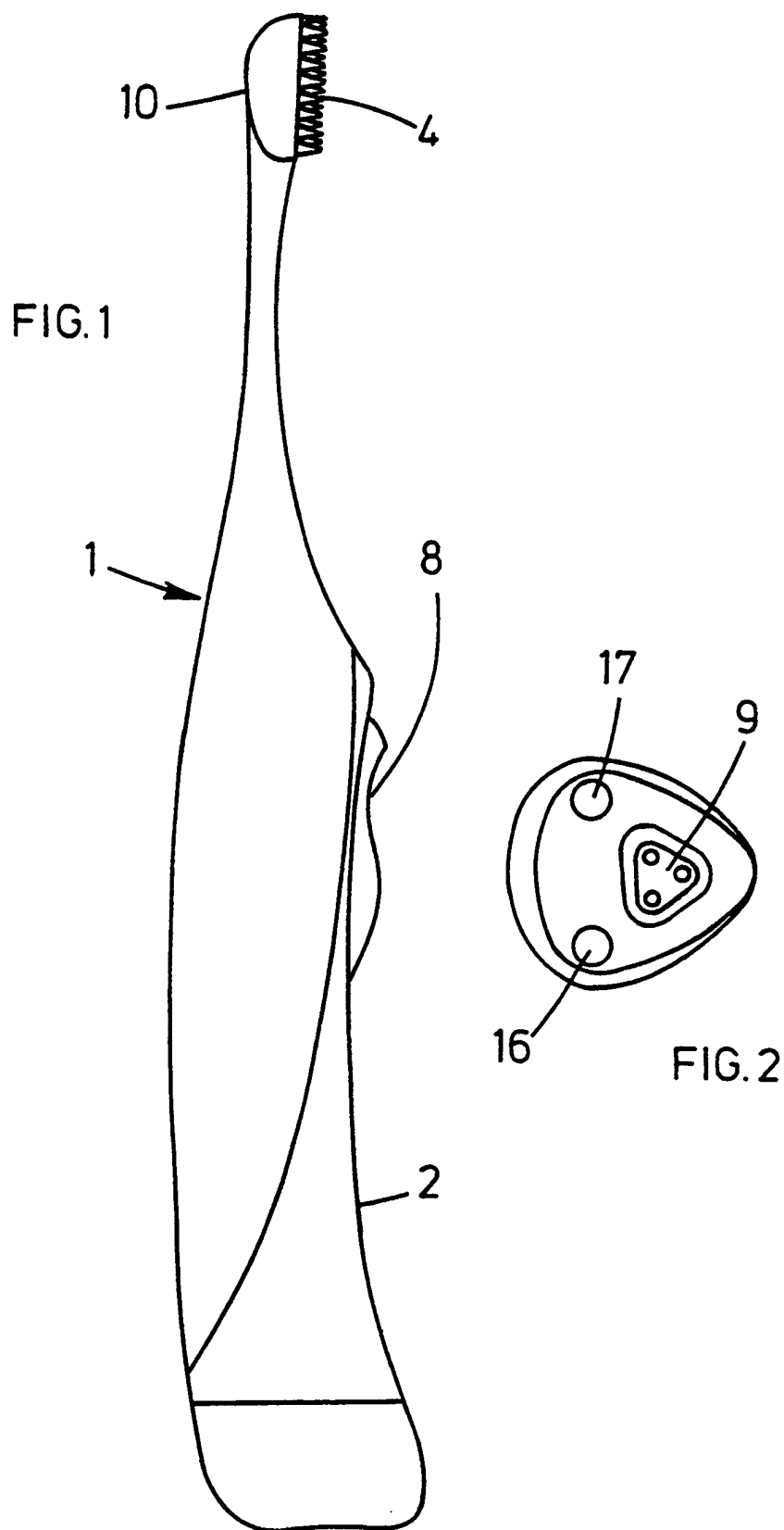
8. A toothbrush as in any of Claims 1 to 5, characterised in that the cleaning head 4 is formed as a generally cylindrical member of a relatively soft, or resilient, material such as, for example, foam rubber.

9. A toothbrush as in any of Claims 1 to 8, characterised in that to protect the inner faces of the lips, cheeks, and tongue, of the user, a guard is provided at the end of the carrier to overlies partially the cleaning head.

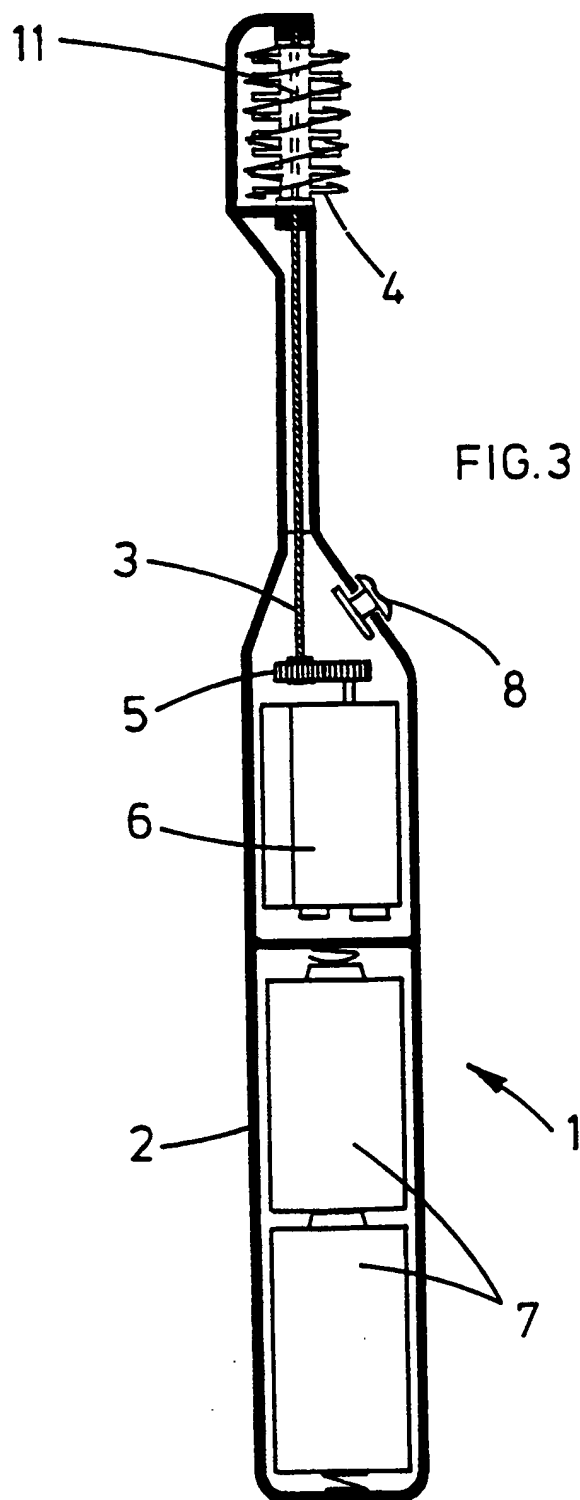
10. A toothbrush as in any of Claims 1 to 9, characterised in that in addition to a rotary motion imposed on the cleaning head 4, the cleaning head 4 during use of the toothbrush is subjected an axial oscillation.

11. A toothbrush as in any of Claims 1 to 10, characterised in that a water supply 16, 18 is provided to the carrier to emerge at the cleaning head 4, and a vacuum extraction means 17, 19 is provided that emerges at the cleaning head 4 whereby to allow the supply of fluid to the cleaning head and the extraction of fluid from the mouth of the user during use of the toothbrush.

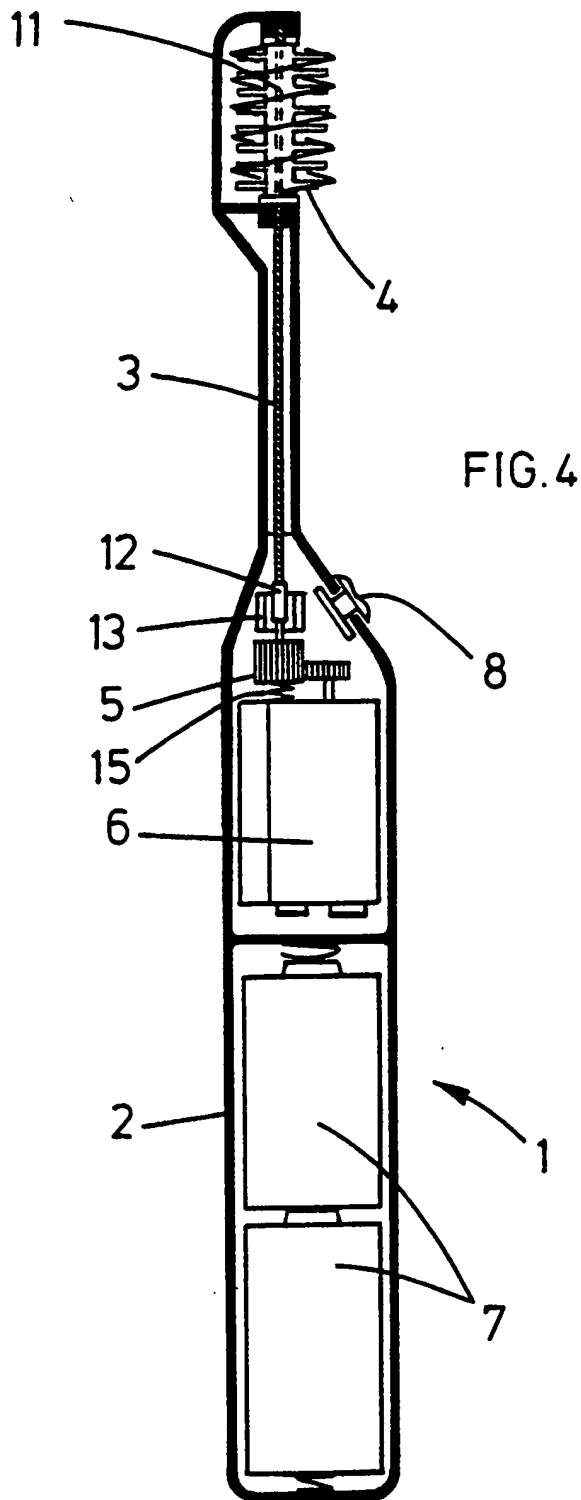
1/4



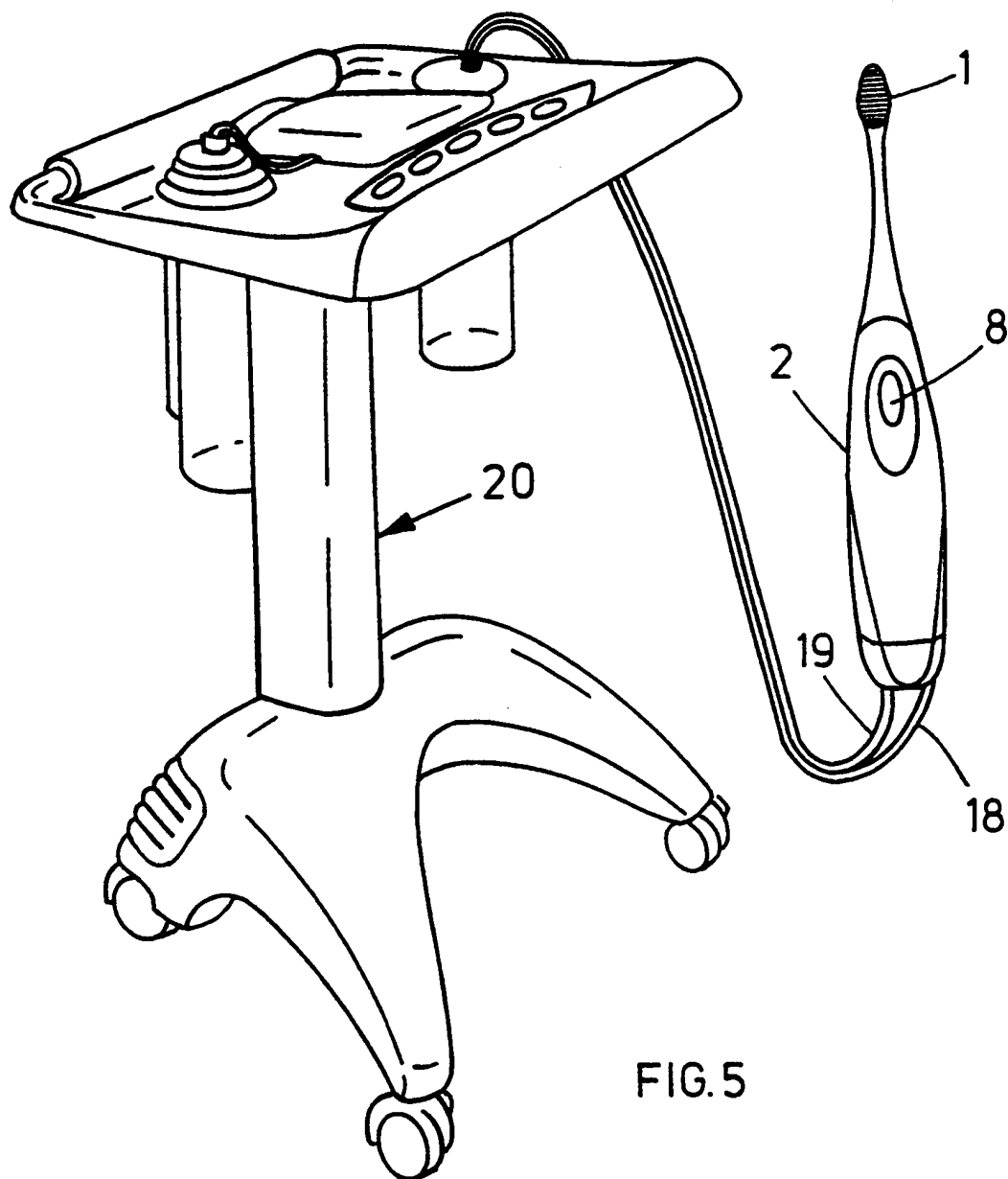
2/4



3/4



SUBSTITUTE SHEET (RULE 26)



A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A61C17/26

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 94 03123 A (CICCO VINCENZO DE) 17 February 1994 see page 7, line 1 - page 13, line 10; figures ---	1-3,6,7, 9
X	US 4 397 055 A (CUCHIARA SAMUEL M) 9 August 1983 see column 2, line 8 - column 4, line 10; figures ---	1-3,6,10
X	US 4 845 796 A (MOSLEY RANDY) 11 July 1989 see column 1, line 59 - column 2, line 39; figures ---	1-4
X	US 4 313 237 A (SMITH ERIC L) 2 February 1982 see abstract; figures ---	1,4-6
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

\*&\* document member of the same patent family

Date of the actual completion of the international search

25 November 1996

Date of mailing of the international search report

03.12.96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+ 31-70) 340-3016

Authorized officer

Ernst, R



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 96/01804

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2 134 934 A (WILHOLT) 1 November 1938 see page 1, line 38 - line 52; figures ---	1,4,5,8 7
X Y	WO 86 02813 A (MASER BRIGITTE) 22 May 1986 see page 9, paragraph 5 - page 16, paragraph 1; figures ---	1-3,6,9 11
Y	DE 12 86 504 B (WERDING) 9 January 1969 see column 1, line 58 - column 4, line 4; figures -----	11

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. onal Application No

PCT/GB 96/01804

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9403123	17-02-94	AU-A- 2441692	03-03-94
US-A-4397055	09-08-83	NONE	
US-A-4845796	11-07-89	NONE	
US-A-4313237	02-02-82	NONE	
US-A-2134934	01-11-38	NONE	
WO-A-8602813	22-05-86	DE-A- 3440836	15-05-86
		DE-A- 3520078	08-01-87
		EP-A- 0199808	05-11-86
DE-B-1286504		NONE	